

Future prospects in Satellite data use for solar energy and daylight : information for environmental, R&D and marketing activities

Marc Fontoynont

ENTPE - National Engineering School of State Public Works
Department of Civil Engineering and Building Sciences
Rue M. Audin F 69120 Vaulx-en-Velin, Lyon, France
Marc.Fontoynont@entpe.fr

Satellites have demonstrated their reliability and accuracy and they can be considered as a reasonable alternative to produce data on solar energy and daylight by comparison with measurement campaigns conducted at ground level.

These data can be considered as a strategic information for activities requiring :

- quick access to data file
- quick decision making
- quick sizing of system
- quick production of maps

But the real challenge today stands in the use of communication technology to deliver the information with a format well adapted to the users. The future of the satellite data processing depends on our ability to process the data far beyond the only delivery of climatic parameters. There is a potential to include in the data processing task the simulation of

systems (solar systems, building components and controls, indoor and outdoor environmental behaviour, etc.) in order to produce more strategic design parameters expressed in size, power, optical performance and of course Euros or dollars.

Our practice of research activities with the industry and design groups has allowed us to identify a whole field of activities where research laboratories involved in climatic data assessment would have the responsibility to process and adapt these data so that they can be used on a regular basis.

Our presentation will demonstrate some case studies where the satellite derived data could be used on an every day basis. They have been selected in fields such as city planning, window design, shading material design, controls, photovoltaics, optical systems for the building, agriculture, etc.

Future prospects in satellite data use for solar energy and daylight

Marc Fontoynt

Light and Radiation Group, ENTPE, Lyon, France

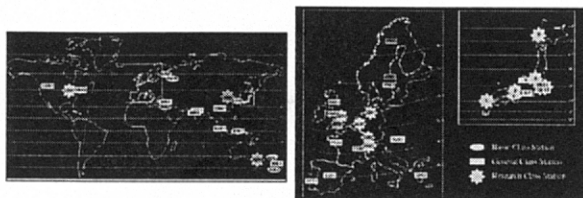
What is the future ?

What was the future ?

The future was: coordinate ground measurements

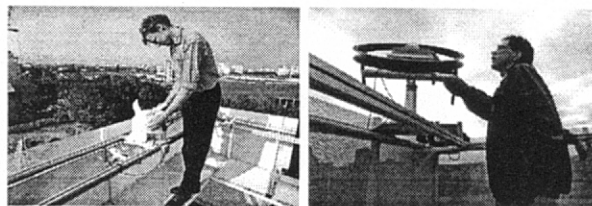
*The future was: deliver data worldwide from satellite
or ground measurement using modern communication
technology (web servers and CD-ROM)*

The future was: coordinate ground measurements



International Daylight Measurement Programme, 1998
50 ground stations, server developed and managed by D. Dumortier, ENTPE
<http://www.idmp.entpe.fr>

Which confidence in large networks of ground stations?



Solar Radiation and Daylight Measurement
maintenance and quality control

*The future was: deliver data worldwide from satellite
or ground measurement using modern communication
technology (web servers and CD-ROM)*

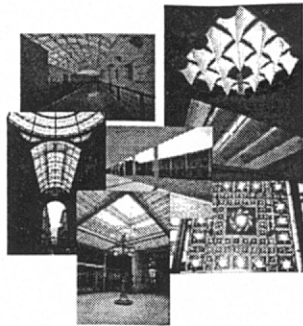


Programme EC-DGXII-JOULE
January 1996 - March 1999
Del very March 1999

**European Server of Solar Radiation
and Daylight Data**



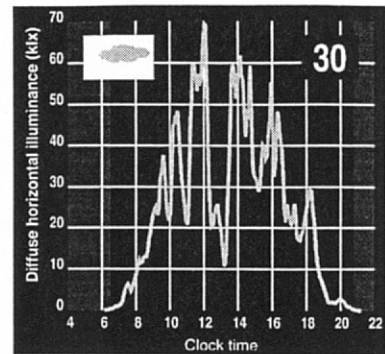
M. Fontoynt, D. Dumortier (Coordination) - Ecole Nationale des Travaux Publics de l'Etat, Val-de-Reuil, France
L. Roche - Building Research Establishment, Garsington, United Kingdom
J.A. Oleith, A. Skarhval - Geophysical Institute, University of Bergen, Bergen, Norway
C. Reine - Fraunhofer Institut für Solare Energiesysteme, Freiburg, Germany
P. Ineichen - Group of Applied Physics, Geneva, Switzerland
J. Page - Expert for the European Commission, Sheffield, United Kingdom
L. Weid - Ecole Nationale Supérieure des Mines de Paris, Sophia-Antipolis, France
D. Heinemann, A. Hammer - University of Oldenburg, Oldenburg, Germany
H.G. Beyer - University of Magdeburg, Magdeburg, Germany



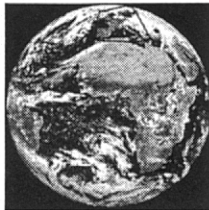
Fields of applications:

- Architecture & building engineering
- Glazing technology
- City planning issues, daylight access
- Input data for softwares Energy demand
- Parameters for controls
- Solar systems, Agriculture

Requirement 1: supply information on variability



Requirement 2 : Cover continuously Western and Central Europe



Zone du programme Satellight



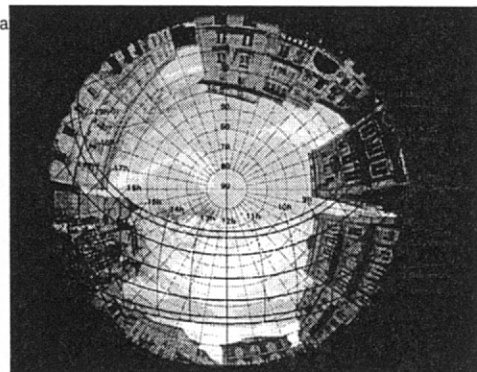
Review of specifications regarding the type of data to be supplied by a web-server of solar radiation and daylight.

Example in daylighting applications

Access to solar radiation and daylight in dense urban areas

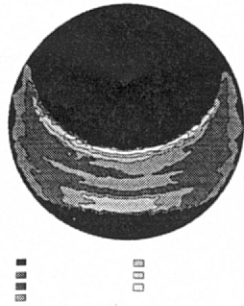


Solar a



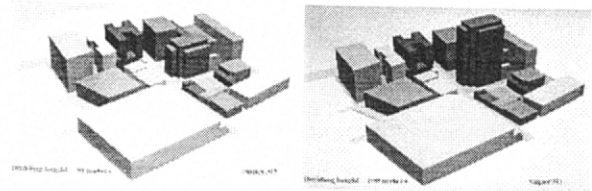
Presentation: Future Prospects in Satellite Data Use for Solar Energy and Daylight by Marc Fontoynt, ENTPE

Solar access / climatic



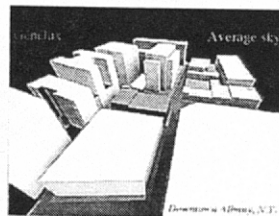
Annual average of luminance around sun for lighting simulations

Study conducted by ENTPE, ASRC, Doyle Mc Cutchen San Francisco

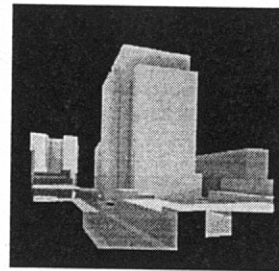


Assessment of the financial impact related to the construction of a high rise building in downtown Albany, N.Y. :
Impact on annual lighting consumption and rental rates

Need for illuminances probabilities, sky luminances distributions, every hour, direct sunlight, format suitable for daylighting simulation programmes



Optical simulations with genlux-web, climatic data from ASRC.



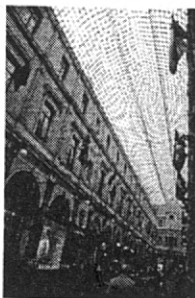
Impact on the annual lighting consumption of neighbouring office buildings:

- + \$ 12,500 per year (height 50 m)
- + \$ 20,000 per year (height 100m)

Impact on rental value :

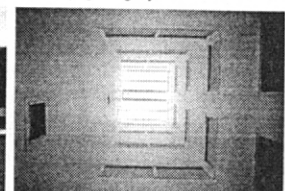
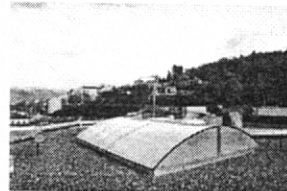
- \$ 130,000 per year (height 50 m)
- \$ 200,000 per year (height 100 m)

Access to daylight in dense urban areas: design and city planning rules



Hours per year of access to daylight and sunlight

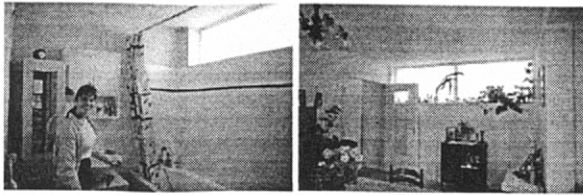
Performance assessment of daylighting systems



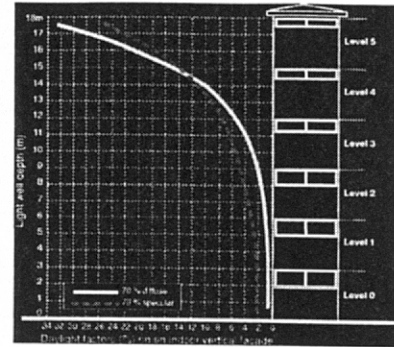
Puits de lumière, Unieux, Loire

Presentation: Future Prospects in Satellite Data Use for Solar Energy and Daylight by Marc Fontoyntont, ENTPE

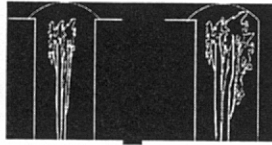
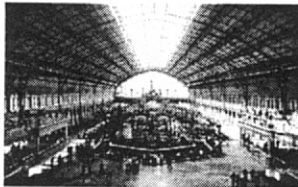
Selection of finish in lightwell and window size variations
Climatic data required: frequencies of zenith luminances



Assessment of luminous fluxes (lm) supplied by secondary daylighting systems at each level
Monthly and annual sums (lumen.hours) Probabilities to exceed illuminances indoor.

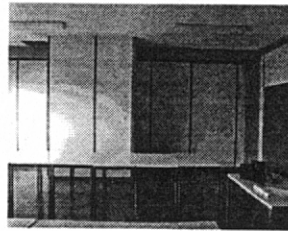


Growing of plants indoor, Photomorphism

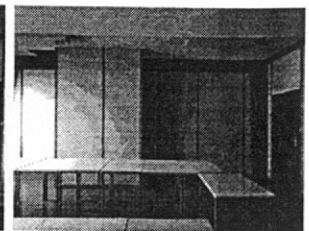


Directionality of daylight (global irradiances and illuminances)
Integrated values

Input data for lighting softwares and computer graphics:
Luminances of the sky vault, sunlight and colors (color coordinates x, y)

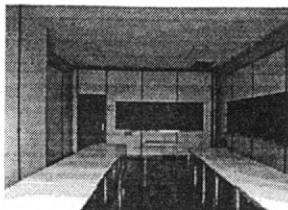


Réality

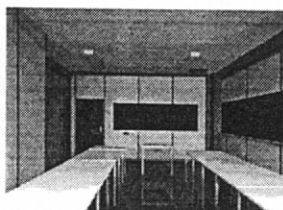


YART / USSE
ENTPE-ESMSE

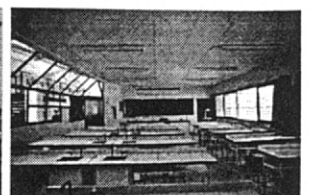
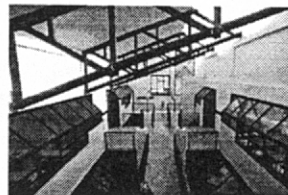
For predesign: frequencies of diffuse horizontal illuminances, color temperatures
For software calculations: sky luminances



Réality



YART / USSE
ENTPE-ESMSE



Collège de Modane